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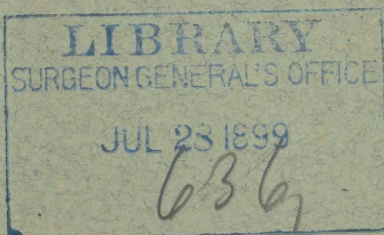
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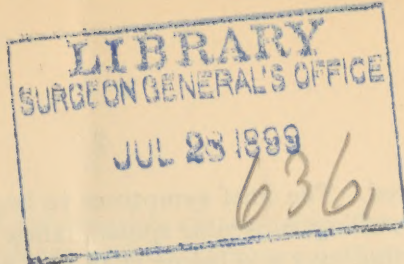
TREATMENT OF FLEXION DEFORMITIES OF THE KNEE-JOINT.

By A. R. SHANDS, M. D.,

WASHINGTON, D. C.

Read before the Medical Society of Virginia, Hot Springs, August 31-
September 2, 1897.





TREATMENT OF FLEXION DEFORMITIES OF THE KNEE JOINT.

By A. R. SHANDS, M. D.,

WASHINGTON, D. C.

It is not the intention of the writer to confine his remarks to what would come within the scope of his paper as it appears on the programme for this meeting of the Medical Society of Virginia. This title was sent to our honorable President many weeks before the paper was written, but it is his purpose to speak of the prevention as well as the correction of knee deformities confined to that most common deformity—flexion of the knee—complicating tubercular disease of the knee-joint, either of the soft or bony structures, or both, and in doing this it has been decided that a few remarks concerning the clinical history of this most formidable disease would not be amiss.

I would like to call your attention to the fact that it is a very prevalent idea to associate orthopedic surgery only with correcting deformities, and that usually by mechanical means. Any one who will look up the etymology of the term will find that it means prevention as well as correction of deformities.

Gross errors in the diagnoses of troubles about the knee-joint should not occur, for a thorough examination of the joint is so easily made—how different from the hip and spinal joints. It is a matter of little importance to the orthopedist whether a *tumor albus* begins as a synovitis or an osteitis, the outcome is practically the same and the treatment similar. The trouble may end in a natural cure with fibrous or bony union with a distorted limb; or such an extensive supuration may follow as to endanger life from sepsis or amyloid changes.

An early diagnosis and efficient treatment are most desirable in these cases. The objective symptoms of tubercular disease of the knee-joint are usually so pronounced that an early diagnosis should be made in almost every case by one who has given any special attention to joint diseases. In spite of this assertion I have seen cases that have been treated for articular rheumatism until supuration is well

advanced. The chief symptoms to be relied upon are local heat, swelling, muscular spasm, reflex atrophy of the muscles both above and below the joint, and tenderness; this is about the order of their importance. Comparison of the diseased joint with its fellow is very valuable assistance. In measuring the lengths of the limbs it should be borne in mind when the disease is well advanced that the diseased one as a rule will be found to be the longer, varying from one fourth to three fourths of an inch, this is not the case in hip disease. This is due to an overgrowth being produced in the cancellous bone of ends of femur by the hyperemia occasioned by the inflammation. Do not take much stock in the history of some traumatism that the parents are always aware of their child having sustained. I have yet to see a case of tumor albus in which there was not a history of a fall or injury of some kind. Upon close questioning you will generally find out that the child was a little lame before the injury was received, and there hangs the true story. The disease is generally responsible for the fall to which so much importance is attached by the parents; the inception of the disease is so insidious, causing unsteadiness of the limbs, that it should give the fall its proper place in the history of the case.

It should be borne in mind that pain is not often a prominent symptom in the early stage of the disease, the diagnosis should be made long before this is developed. Heat of the affected joint is present from the beginning of the trouble and is an important index to the progress of the case; if the joint is kept perfectly quiet it will disappear to return at once if anything goes wrong. It should serve as an urgent indication for protective treatment so long as it exists in any degree. Lameness is an important symptom and will vary according to amount of flexion present. Muscular fixation, nature's effort to immobilize the joint, is a prominent feature from the first; there may be a small arc of painless motion, but will be checked by muscular spasm just as soon as the limit is reached. Muscular spasm is much more prominent in an osteitis than in a synovitis.

The flexors of the knee being so much stronger than the extensors, the limb soon becomes flexed, and if the muscular spasm is unchecked this deformity increases until the limit of flexion is reached. When a flexion reaches a right angle

there is great danger of subluxation of the tibia due to the shape of the joint surfaces and the constant pulling backwards of the strong hamstring muscles.

Without going minutely into the details of the differential diagnosis, I shall content myself with these few diagnostic hints and proceed at once to the management of a case of tumor albus, first, with a view to the *prevention* of deformity, and secondly, to the *correction*, although it is very tempting to go into the general treatment of the disease, but that would necessitate a paper too lengthy for an occasion of this sort.

The fact that there is a tendency for the tuberculous foci to be multiple prevents one from taking very radical surgical measures to remove the diseased areas. If we could feel sure that a single focus of disease existed and we could locate it, it could easily be removed and thereby end the process in its incipency, but the signs that apply to a single focus would also apply with equal force to two or more foci, hence one prefers to adopt more conservative measures in the early stage. In my practice I rely upon immobilization and rest as the best means of bringing about resolution. For the purpose of producing perfect rest and immobilization I know of nothing better than the plaster-of-Paris bandage when properly applied, but this is a dressing that is much abused and unless one is somewhat skilful in applying it, disappointment in results is sure to follow. It is desired to emphasize the point that the plaster is to be so applied as to produce absolute immobilization. I have had opportunities of removing plaster casts from knees that did not immobilize the joints, but were fully movable up and down and admitting of several degrees of flexion under the dressing. Fortunately the dressing that most favors resolution is also the one that will best prevent deformity, and if one realizes fully the severity of the disease with which he has to contend, he will not only adopt the dressing that will best meet the exigencies of the case, but will hold himself responsible for the maintenance of the splint or dressing in the position to prevent the deformity.

I would like to say a word here about the very prevalent opinion among many who have not had an extensive experience in the treatment of chronic joint diseases that immobilization will produce ankylosis. It is a great mistake to

think such is the case. My experience in the treatment of these cases is that the real function of the joint can be better preserved by absolute immobilization than by any attempts of passive motion in a joint that is in a high state of inflammation. Vernuil has said that this fear has led many to do very bad surgery. He calls it "Ankylophobia", and asserts that not a single case has ever been offered to prove that such a thing has been produced. I am fully convinced that ankylosis is produced by the products of inflammation and suppuration, therefore anything that will check these processes will limit the ankylosis.

Before taking up the subject of correction of deformity of the knee, I would like to insist upon the rule—"prevent deformity", and in doing this rest assured that you are using the best means of preserving the functions of the joint, aiding resolution and thereby hastening the cure.

For sake of convenience of description I will divide the flexion deformity almost always present in tumor albus into three classes:

1st.—Flexion due to contracture of the hamstring tendons.

2d.—Flexion due to contraction of the hamstring tendons with adhesions of the articular surface.

3d.—Flexion due to the contraction of the tendons and firm fibrous adhesions with bony ankylosis.

Treatment of Stage of Deformity.—For many reasons it is rare that the orthopedist sees a case of tumor albus during the early stage; it is generally when the deformity is well established that he is consulted. The problem how to correct the deformity is often a perplexing one, and if you can assure the parents that it can be done by any means short of operative procedure you will at once gain their confidence and very probably secure the patient. The splints that have been devised for this purpose are very numerous, many are complicated and have not given very satisfactory results except in hands of those who devised them. I have tried nearly all of them and have been more or less disappointed in all except two, viz: the Billroth splints to overcome the deformity and the Thomas splint as an ambulatory apparatus which also serves purpose of preventing the deformity.

First Stage.—In the early stage of tumor albus the flexion deformity is almost always accompanied with much

swelling due to infiltration of the peri articular structure. Before attempting to overcome any of the deformity I always get rid of as much of the swelling as possible, which is accomplished by compression and fixation. Compression is gotten by strapping the joint with strips of rubber adhesive plaster, about one half inch wide, beginning about five inches below the patella, applying them diagonally around the limb in a criss-cross arrangement extending it about five inches above the patella. These straps should be put on just as tightly as possible. Over this is applied a gauze bandage extended well up the thigh and down the calf. A snugly-applied plaster-of-Paris case completes the dressing. No attempt to correct any deformity should be made at the first sitting. The dressing should be allowed to remain on for a week or ten days and, if the flexion is due to tendinous contractures, at the end of that time upon the removal of the dressings the deformity will be easily corrected with gentle manual pressure. If all of the deformity cannot be reduced without force the same dressing should be reapplied with the limb in its improved position. In all probability at end of another week or ten days the muscular spasm will have subsided sufficiently to allow limb to be brought into a straight position without force. When the limb is straight a Thomas splint should be applied and child allowed to walk. Just as long as there is any pain, spasm, or swelling of the joint the local dressing above described should be kept on in addition to the walking apparatus. The latter should be used just as long as in your judgment there is danger of return of any acute symptoms. No definite time can be laid down for discontinuing use of the brace—one will have to use his own judgment in each case. I never use crutches in children if I can possibly help it, for they do not afford proper protection to the joint even when plaster of Paris is used. When the pain and spasm subside the child will surely bear weight on the limb in locomotion, besides they render the child more liable to falls and tumbles. The brace bears all of the weight as a peroneal crutch. Be very cautious in discarding the brace. When in your judgment the time has come to discontinue its use, remove all of the dressings and let patient use limb continuously for a week and if the range of motion has increased in that time it may be safe to discard it.

Second Stage.—When the flexion deformity is due to contraction of the hamstring tendons, that is actual shortening, and fibrous adhesions, result of the reparative processes of nature, more radical measures will have to be adopted. For the correction of flexion due to this state of affairs I have gotten such excellent results from the use of the Billroth splint that I use it almost to the exclusion of everything else. During my term of service as interne in Hospital for Ruptured and Crippled, New York, this splint was used very extensively, in fact in almost every case in which there was not very firm fibrous adhesions or bony ankylosis.

This splint is very similar to the sector splint that is used for the same purpose and has the advantage of being a very cheap apparatus and is very simple. It consists of two fan-shaped tin strips connected by light steel bars which are joined by a slot and screw. The splint is applied as follows: Fit the tin strips to the limb before applying them, shape the steel bar over the prominences of the knee, having the joints opposite the knee-joint. Protect the bony prominences with pieces of double-faced canton-flannel or piano felting. First apply a canton-flannel bandage from upper third of the thigh to the lower third of the leg and over this apply plaster-of-Paris bandages, incorporating the splints in the plaster in the position in which they have been previously fitted. The plaster should be at least a half inch thick in the popliteal space. Before the plaster is thoroughly hardened, with a sharp knife make a transverse incision through the plaster filling the popliteal space, this incision should be continued across the anterior aspect of the knee above and below the patella, and the plaster between the anterior incisions should be removed. This makes the plaster case in two sections joined by the splints. The next day the leg can be extended to the pain limit and by inserting a wedge-shaped piece of cork in the posterior incision the improved position can be retained. Every few days, every day if not very painful, this stretching process should be repeated, retaining what is gained at each sitting with a piece of cork.

If, after correcting the flexion, there is any knock-knee present, that can be corrected with the same splints by placing them on the anterior and posterior aspects of the knee and making the incision on the outside for the piece of cork.

It is surprising to see what can be done with these splints; with patience and perseverance knees can be straightened in

this manner that at first sight would appear to be suitable only for the knife and an anesthetic. After the deformity is corrected the same preventive treatment is applicable here that was described above.

If these measures are faithfully carried out there will be but few cases left for operative measures.

Third Stage.—In this class of cases I would include those cases that are held in a flexed position by firm fibrous and bony ankylosis. This condition of affairs is seen most often after most of the acute manifestations of the disease have subsided, limb being left ankylosed in a distorted position. These are the cases in which only operative measures offer any hope of correcting the deformity. Resection of the joint is here indicated and in properly selected cases most excellent results can be obtained. One should hesitate, however, to adopt such radical measures if there is any indication that there is any active process of the tubercular osteitis present unless he is sure of removing all of the foci of the disease. In such cases it is much better to postpone the operation until the disease has entirely subsided if he is contemplating the operation for the correction of the deformity only.

I have no particular operation to advocate for I have done almost a different operation on every knee I have resected.

A recurrence of deformity, either flexion or knock-knee, is almost sure to occur in resected knees in children, if the knee is left unprotected. A stiff leather knee-splint, with laces, is a very efficient convalescent splint for these cases and should be worn for several years. The ambulatory brace is not necessary in this class of cases; patient can be allowed to use crutches until he becomes accustomed to walk on the limb, which is usually done in three or four months.

In cases where flexion is due to fibrous adhesions admitting of a few degrees of passive motion, it is a common practice with some surgeons to break up these adhesions by "*redressement forcé*" under an anesthetic, but in doing this two points of greatest importance should be borne in mind, viz.: *first*, you should be sure that a sufficient length of time has elapsed since the subsidence of the acute symptoms to insure you there is no danger of relighting the old disease by breaking down these old adhesions; and *second*, that there is great danger of injuring the popliteal vessels and

nerves by too rapidly straightening the joint that has been in a flexed position for years. In adopting these means of correcting flexion great care should be exercised not to use much force or attempt to correct much of the deformity at any one sitting—better do it at several sittings.

It is also best to divide the hamstring tendons subcutaneously at first sitting. I have recently had the opportunity of seeing a very disastrous result from this method of treatment—patient was a young adult with a flexed knee which was corrected by “redressement forcé”; result was gangrene of leg which had to be amputated above the knee.

In many of these old cases the flexion deformity is complicated with subluxation of the tibia, that is the head of tibia will be in the posterior intercondyloid space and out of the normal vertical plane. It is almost impossible to correct the subluxation even when the flexion can be overcome by manual force. This is due to two causes, viz.: fibrous adhesions and the enlargement of the femoral condyles, result of the old osteitis of their cancellous structure. This condition should be regarded as one indication for the resection of the joint.

Many braces have been devised to correct subluxation of the tibia, but it has not been my good fortune to see any very brilliant results follow their use, except in cases where the fibrous adhesions were slight and condyles not enlarged.

To better illustrate a resection of the knee I will here report a case that I recently operated on.

William Bell, age 10, admitted to the orthopedic service of the Emergency Hospital and Central Dispensary, Washington, D. C., April 27, 1897.

Diagnosis: Old tubercular osteitis of right knee with flexion and subluxation of tibia.

Date of inception of disease: Summer of 1893.

Present condition: General condition of patient excellent (well shown in Figure 1). Atrophy of right lower limb marked; numerous cicatrices all around the knee, especially prominent on external aspect. No sinuses or other evidence of any active process of disease. Leg flexed to right angle on the thigh, tibia subluxated. About five or six degrees of passive motion, but voluntary motion *nil*. No pain or tenderness on manipulating the limb. Length of limb equal.

Family history negative. *Personal history* unsatisfac-



FIGURE 1.

tory on account of ignorance of mother, who says that her boy hurt his knee with an axe in summer four years ago. Abscesses formed at different times, which were either incised or opened spontaneously. Mother says he had running sores for about two years during which time he was in bed.

Patient was from the rural districts of Virginia, and had no professional attention. This is evidently one of nature's

cures, who surely has treated him very well in every way except using means of preventing deformity.

April 30th, under ether anesthesia, I divided subcutaneously the hamstring tendons and made an attempt to correct some of the deformity by gentle manual pressure, but with little success, as the adhesions were very firm. It was impossible to overcome the subluxation in slightest degree on account of the projecting and enlarged condyles, hence a resection was decided on.

May 8th, with the able assistance of Dr. Wallace Johnson, I resected the joint in the following manner: A transverse incision was made across the patella which was divided with a saw, my object being to reunite it on closing the wound. Upon opening the joint, the patella, ligaments, and capsule were included in one mass of fibrous adhesions. After exposing the head of the tibia and condyles of the femur, the tips of the condyles were sawed off, which revealed a cavity in each, easily admitting the end of my index finger.

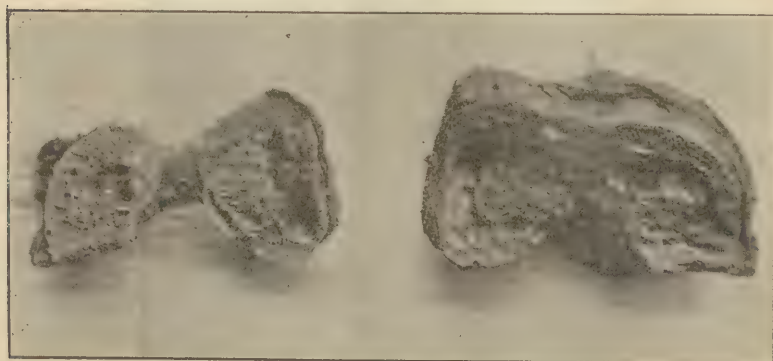


FIGURE 2.

These cavities were filled with a harmless-looking, gelatinous mass. No pus was found anywhere. These cavities were walled off with very hard bone. To be sure of removing all unhealthy bone I sawed another section above the cavities. [The condition of these condyles is shown in Figure 2]. A thin section was then sawed off the tibia, that revealed a spot of diseased-looking bone which was scraped out. The limb was then easily brought into position shown in Figure 3.



FIGURE 3.

The femur and tibia were fastened together with kangaroo tendon, fragments of patella removed and wound closed and limb put up in plaster-of-Paris spica which was extended from the toes to the nipples.

On the third day boy's temperature reached 101° . After remaining at that point for three days it gradually dropped to normal where it practically remained during convales-

cence, which was uninterrupted in every respect. The first night after the operation the patient had one hypodermic of morphine, after this an occasional dose of Epsom salts was all of the medicine he had. After the second day he never once complained of pain. This I am sure was due to the fact that the limb was absolutely immobilized by the plaster-of-Paris spica. At the end of five weeks the dressings were removed, and, as firm bony union was found to exist, a short plaster case was applied. I shall cause the patient to wear a convalescent splint on this knee for at least two years, that is if I can keep track of him. At present time, four months after operation, the boy walks very well with a shoe with cork soles three quarters of an inch thick.

It was the intention of the writer to include in this paper a report in detail of a number of flexed knees corrected by the Billroth splints, but as the paper has already reached a length that was not anticipated, that report will have to be omitted.

In conclusion I would say that if these tubercular knees are properly treated from the beginning, i. e. by *rest* and *fixation*, in a straight position, there will not be need of any operative procedure to correct deformities.

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